CHI MEI
OPTOELECTRONICS CORP.

Approval

TFT LCD Approval Specification

MODEL NO.: N150X1-L05

Customer: _____

Approved by: _____

Note:

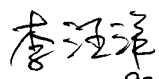| Liquid Crystal Display Division		
QRA Dept.	TDD I Dept.	PDD I Dept.
Approval	Approval	Approval
陳 永一 92. 3. 14	李汪溎 92.3.13	林 添仁 92. 3. 13

Issued Date: Mar. 12, 2003
Model No.: N150X1–L05

Approval

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Version 2.0

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REVISION HISTORY

Version	Date	Section	Description
Ver.1.0	Nov.29'02	All	preliminary Specification was first issued.
Ver.2.0	Mar.12'03	All	approval Specification was first issued.

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1. GENERAL DESCRIPTION

1.1 OVERVIEW

N150X1- L05 is a 15.0" TFT Liquid Crystal Display module with single CCFL Backlight unit and 20 pins LVDS interface. This module supports 1024 x 768 XGA mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The inverter module for Backlight is not built in.

1.2 FEATURES

- Thin and Light Weight

- XGA (1024 x 768 pixels) resolution

- DE (Data Enable) only mode

- 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	304.1 (H) x 228.1 (V) (15.0" diagonal)	mm	(1)
Bezel Opening Area	307.8 (H) x 231.6 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1024 x R.G.B. x 768	pixel	-
Pixel Pitch	0.297 (H) x 0.297 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	**Hard coating (2H), Low Reflection**	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	316.8	317.3	317.8	mm	
	Vertical(V)	241.5	242.0	242.5	mm	(1)
	Depth(D)	6.4	6.7	7.0	mm	
Weight		-	590	605	g	-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

(2) Connector mounting position

+/- 0.5mm

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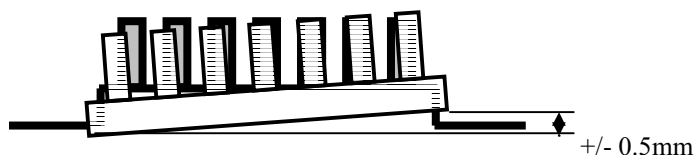
2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	200	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	2.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta $\leq$ 40 º)

(b) Wet-bulb temperature should be 39 º Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel surface should be 0 ºC Min. and 60 ºC Max.

Note (3) 2ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 500 Hz, 0.5 Hr / cycle, 4 cycles for each X, Y, Z.

At Room Temperature   LCD Module

Side Mount Fixing Screw   Side Mount Fixing Screw

                                                                            Stage

Gap=2mm   Bracket
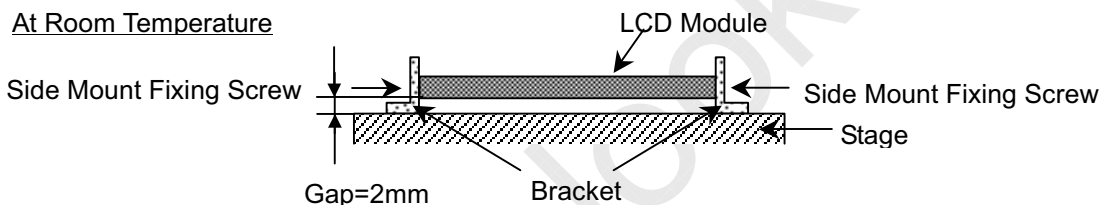
Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture. **The gap between panel and testing table should be less then 2mm.**

Relative Humidity (%RH)

Operating Range

Storage Range

Temperature (ºC)
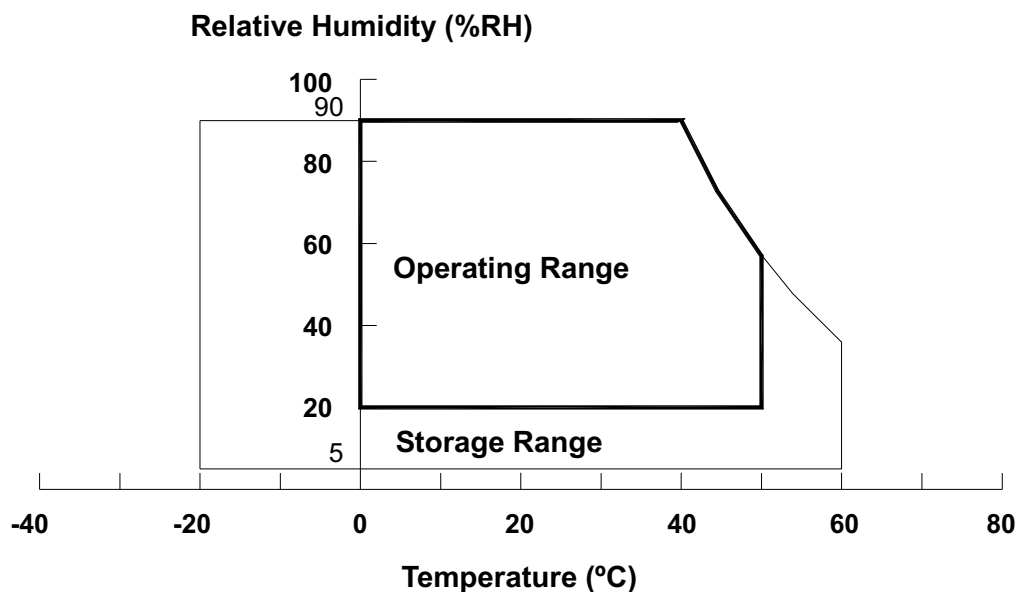
Note (6) MTBF Life (for cell): min. 50000 hrs

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2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+4.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	Vcc+0.3	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_L	-	2.5K	V_{RMS}	(1), (2), I_L = 6.0 mA
Lamp Current	I_L	-	7.5	mA_{RMS}	(1), (2)
Lamp Frequency	F_L	-	80	KHz	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation

should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to 3.2 for further information).

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	3.0	3.3	3.6	V	-
Ripple Voltage		V_{RP}	-	50	-	mV	-
Rush Current		I_{RUSH}	-	-	*1.5*	A	(2)
Power Supply Current	White	Icc	-	400	-	mA	(3)a
	Black		-	600	-	mA	(3)b
Logical Input Voltage	"H" Level	V_{IL}	-	-	+100	mV	-
	"L" Level	V_{IH}	-100	-	-	mV	-
Terminating Resistor		R_T	-	100	-	Ohm	-

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions

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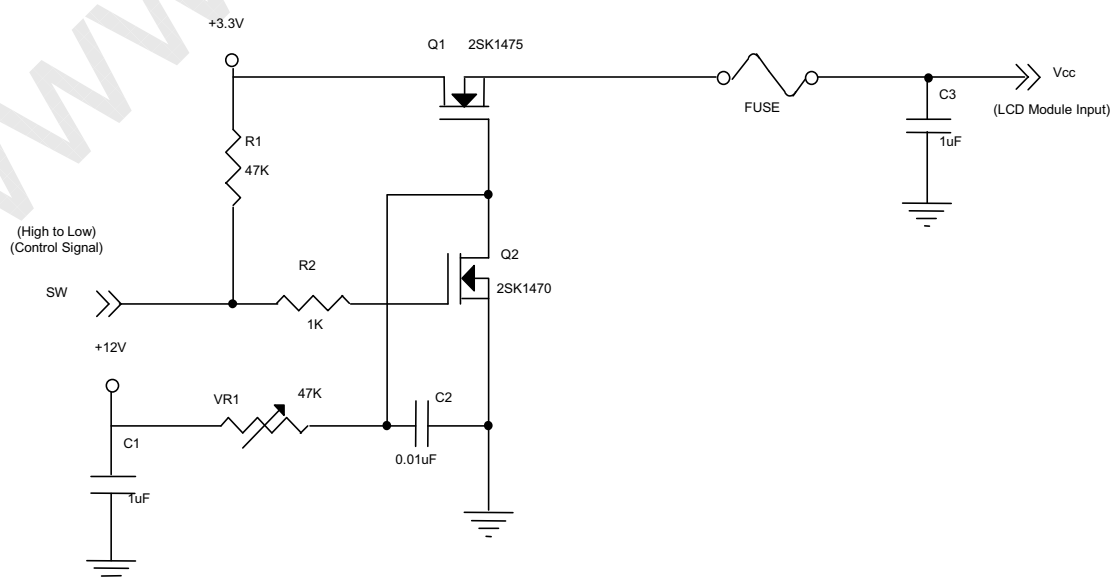
Vcc rising time is 470us
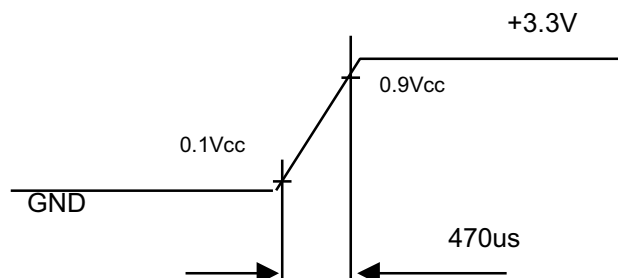
Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern
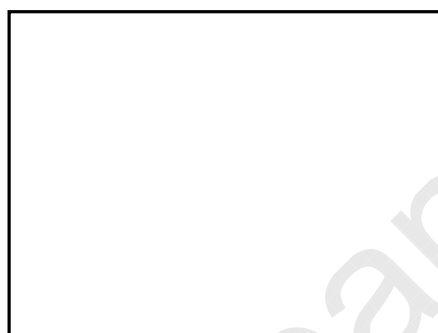
Active Area

b. Black Pattern

Active Area

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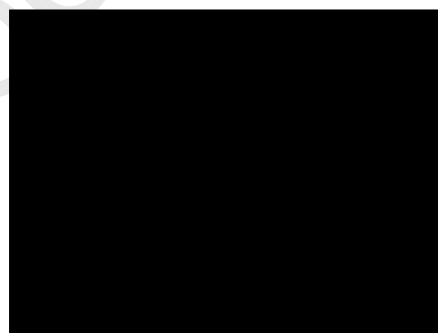
3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L	612	680	748	V_{RMS}	I_L = 6.0 mA
Lamp Current	I_L	2.0	6.0	6.5	mA_{RMS}	(1)
Lamp Turn On Voltage	V_S	-	-	1150 (25 ^{o}C)	V_{RMS}	(2)
		-	-	1500 (0 ^{o}C)	V_{RMS}	(2)
Operating Frequency	F_L	40	60	80	KHz	(3)
Lamp Life Time	L_{BL}	10,000	15,000	-	Hrs	(5)
Power Consumption	P_L	-	4.08	-	W	(4), I_L = 6.0 mA

Note (1) Lamp current is measured by utilizing a high frequency current meter as shown below:
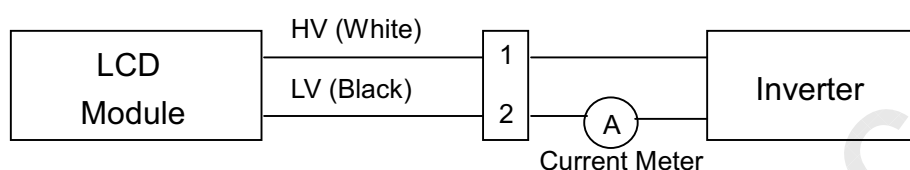

Note (2) The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4) $P_L = I_L \times V_L$

Note (5) The lifetime of lamp can be defined as the time in which it continues to operate under the condition Ta = 25 ±2 ^{o}C and I_L = 6.0 mArms until one of the following events occurs:

(a) When the brightness becomes or lower than 50% of its original value.

(b) When the effective ignition length becomes or lower than 80% of its original value. (Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)

Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid producing too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

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3.3 EDID Signal Timing and Data

EDID Signal Timing and Electrical Characteristics
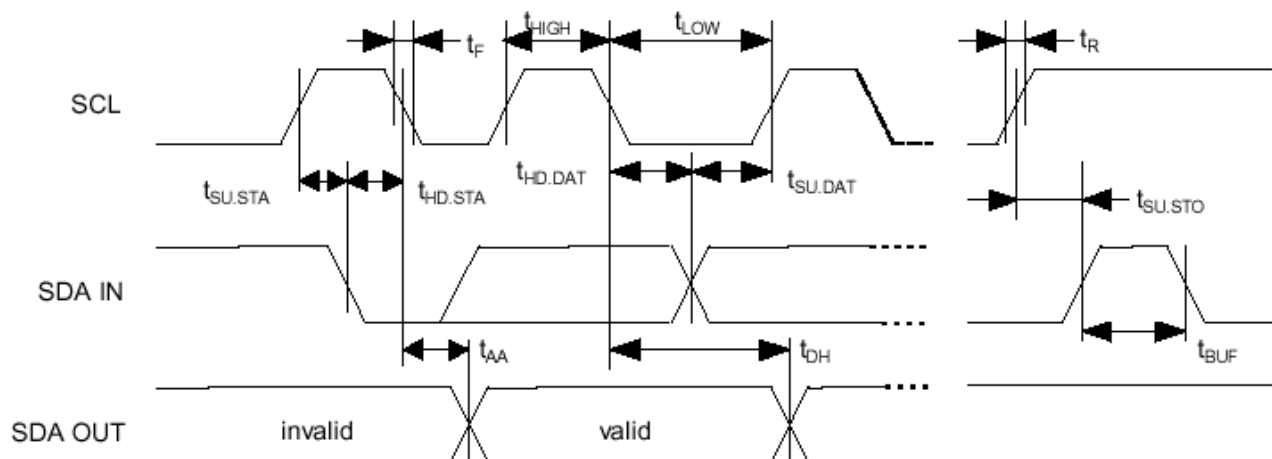
Parameter	Symbol	V_{CC}=4.5 V to 5.5 V			V_{CC}=1.8 V to 4.5 V			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
SCL clock frequency	f_{SCL}	0	—	400	0	—	100	kHz
SCL clock time "L"	t_{LOW}	1.0	—	—	4.7	—	—	µs
SCL clock time"H"	t_{HIGH}	0.9	—	—	4.0	—	—	µs
SDA output delay time	t_{AA}	0.1	—	0.9	0.1	—	3.5	µs
SDA output hold time	t_{DH}	50	—	—	100	—	—	ns
Start condition setup time	$t_{SU.STA}$	0.6	—	—	4.7	—	—	µs
Start condition hold time	$t_{HD.STA}$	0.6	—	—	4.0	—	—	µs
Data input setup time	$t_{SU.DAT}$	100	—	—	200	—	—	ns
Data input hold time	$t_{HD.DAT}$	0	—	—	0	—	—	ns
Stop condition setup time	$t_{SU.STO}$	0.6	—	—	4.7	—	—	µs
SCL · SDA rising time	t_R	—	—	0.3	—	—	1.0	µs
SCL · SDA falling time	t_F	—	—	0.3	—	—	0.3	µs
Bus release time	t_{BUF}	1.3	—	—	4.7	—	—	µs
Noise suppression time	t_I	—	—	50	—	—	100	ns

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EDID Data

The following data is based on VESA Enhanced EDID proposal.

Byte # (decimal)	Byte # (hex)	Field Name and Comments	Value (hex)	Value (binary)
0	00	Header	00	00000000
1	01	Header	FF	11111111
2	02	Header	FF	11111111
3	03	Header	FF	11111111
4	04	Header	FF	11111111
5	05	Header	FF	11111111
6	06	Header	FF	11111111
7	07	Header	00	00000000
8	08	EISA ID manufacturer name	06	00000110
9	09	EISA ID manufacturer name	10	00010000
10	0A	ID product code	15	00010101
11	0B	ID product code (hex LSB first)	00	00000000
12	0C	ID S/N (fixed "0")	00	00000000
13	0D	ID S/N (fixed "0")	00	00000000
14	0E	ID S/N (fixed "0")	00	00000000
15	0F	ID S/N (fixed "0")	00	00000000
16	10	Week of manufacture (fixed "00")	00	00000000
17	11	Year of manufacture (fixed "2002")	0C	00001100
18	12	EDID structure version # ("1")	01	00000001
19	13	EDID revision # ("3")	03	00000011
20	14	Video I/P definition ("digital")	80	10000000
21	15	Max H image size ("30.4128 cm")	1E	00011110
22	16	Max V image size ("22.8096 cm")	17	00010111
23	17	Display Gamma (Gamma = "2.2")	78	01111000
24	18	Feature support ("Active off, RGB Color")	28	00101000
25	19	Red/Green (Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0)	77	01110111
26	1A	Blue/White (Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0)	F1	11110001
27	1B	Red-x (Rx = "0.626")	A0	10100000
28	1C	Red-y (Ry = "0.355")	5A	01011010
29	1D	Green-x (Gx = "0.294")	4B	01001011
30	1E	Green-y (Gy = "0.589")	96	10010110
31	1F	Blue-x (Bx = "0.144")	24	00100100
32	20	Blue-y (By = "0.097")	18	00011000
33	21	White-x (Wx = "0.309")	4F	01001111
34	22	White-y (Wy = "0.329")	54	01010100
35	23	Established timings 1	00	00000000
36	24	Established timings 2 (1024x768@60Hz)	08	00001000
37	25	Manufacturer's reserved timings	00	00000000
38	26	Standard timing ID # 1	01	00000001
39	27	Standard timing ID # 1	01	00000001
40	28	Standard timing ID # 2	01	00000001
41	29	Standard timing ID # 2	01	00000001
42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001
44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001

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Byte # (decimal)	Byte # (hex)	Field Name and Comments	Value (hex)	Value (binary)
48	30	Standard timing ID # 6	01	00000001
49	31	Standard timing ID # 6	01	00000001
50	32	Standard timing ID # 7	01	00000001
51	33	Standard timing ID # 7	01	00000001
52	34	Standard timing ID # 8	01	00000001
53	35	Standard timing ID # 8	01	00000001
54	36	Detailed timing description # 1 Pixel clock ("65 MHz")	64	01100100
55	37	# 1 Pixel clock (hex LSB first)	19	00011001
56	38	# 1 H active ("1024")	00	00000000
57	39	# 1 H blank ("320")	40	01000000
58	3A	# 1 H active : H blank ("1024 : 320")	41	01000001
59	3B	# 1 V active ("768")	00	00000000
60	3C	# 1 V blank ("38")	26	00100110
61	3D	# 1 V active : V blank ("768 : 38")	30	00110000
62	3E	# 1 H sync offset ("24")	18	00011000
63	3F	# 1 H sync pulse width ("136")	88	10001000
64	40	# 1 V sync offset : V sync pulse width ("3 : 6")	36	00110110
65	41	# 1 H sync offset : H sync pulse width : V sync offset : V sync width ("24 : 136 : 3 : 6")	00	00000000
66	42	# 1 H image size ("304.128 mm")	30	00110000
67	43	# 1 V image size ("228.096 mm")	E4	11100100
68	44	# 1 H image size : V image size ("304 : 228")	10	00010000
69	45	# 1 H boarder ("0")	00	00000000
70	46	# 1 V boarder ("0")	00	00000000
71	47	# 1 Flags ("Non-Interlace, Non-Stereo, Digital Separate")	18	00011000
72	48	Detailed timing description # 2	00	00000000
73	49	# 2 Flag	00	00000000
74	4A	# 2 Reserved	00	00000000
75	4B	# 2 FE (hex) defines ASCII string (Model Name "N150X1", ASCII)	FE	111111110
76	4C	# 2 Flag	00	00000000
77	4D	# 2 1st character of string ("N")	4E	01001110
78	4E	# 2 2nd character of string ("1")	31	00110001
79	4F	# 2 3rd character of string ("5")	35	00110101
80	50	# 2 4th character of string ("0")	30	00110000
81	51	# 2 5th character of string ("X")	58	01011000
82	52	# 2 6th character of string ("1")	31	00110001
83	53	# 2 New line character # 2 indicates end of ASCII string	20	00100000
84	54	# 2 Padding with "Blank" character	20	00100000
85	55	# 2 Padding with "Blank" character	20	00100000
86	56	# 2 Padding with "Blank" character	20	00100000
87	57	# 2 Padding with "Blank" character	20	00100000
88	58	# 2 Padding with "Blank" character	20	00100000
89	59	# 2 Padding with "Blank" character	20	00100000
90	5A	Detailed timing description # 3	00	00000000
91	5B	# 3 Flag	00	00000000
92	5C	# 3 Reserved	00	00000000
93	5D	# 3 FE (hex) defines ASCII string (Model Name "N150X1", ASCII)	FE	11111110
94	5E	# 3 Flag	00	00000000
95	5F	# 3 1st character of string ("N")	4E	01001110
96	60	# 3 2nd character of string ("1")	31	00110001
97	61	# 3 3rd character of string ("5")	35	00110101
98	62	# 3 4th character of string ("0")	30	00110000

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Byte # (decimal)	Byte # (hex)	Field Name and Comments	Value (hex)	Value (binary)
99	63	# 3 5th character of string ("X")	58	01011000
100	64	# 3 6th character of string ("1")	31	00110001
101	65	# 3 New line character # 3 indicates end of ASCII string	20	00100000
102	66	# 3 Padding with "Blank" character	20	00100000
103	67	# 3 Padding with "Blank" character	20	00100000
104	68	# 3 Padding with "Blank" character	20	00100000
105	69	# 3 Padding with "Blank" character	20	00100000
106	6A	# 3 Padding with "Blank" character	20	00100000
107	6B	# 3 Padding with "Blank" character	20	00100000
108	6C	Detailed timing description # 4	00	00000000
109	6D	# 4 Flag	00	00000000
110	6E	# 4 Reserved	00	00000000
111	6F	# 4 FC (hex) defines Monitor name ("Color LCD", ASCII)	FC	11111100
112	70	# 4 Flag	00	00000000
113	71	# 4 1st character of name ("C")	43	01000011
114	72	# 4 2nd character of name ("o")	6F	01101111
115	73	# 4 3rd character of name ("l")	6C	01101100
116	74	# 4 4th character of name ("o")	6F	01101111
117	75	# 4 5th character of name ("r")	72	01110010
118	76	# 4 6th character of name (<space>)	20	00100000
119	77	# 4 7th character of name ("L")	4C	01001100
120	78	# 4 8th character of name ("C")	43	01000011
121	79	# 4 9th character of name ("D")	44	01000100
122	7A	# 4 New line character # 4 indicates end of Monitor name	0A	00001010
123	7B	# 4 Padding with "Blank" character	20	00100000
124	7C	# 4 Padding with "Blank" character	20	00100000
125	7D	# 4 Padding with "Blank" character	20	00100000
126	7E	Extension flag	00	00000000
127	7F	Checksum	DD	11011101

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4. BLOCK DIAGRAM

4.1 TFT LCD MODULE

```
Rxin0(+/-) ──→ ┌──────────────┐ ──→ ┌──────────────────┐        ┌───────┐   ┌─────────────────┐
Rxin1(+/-) ──→ │ INPUT        │     │ LVDS INPUT /     │ ──→    │ SCAN  │   │ TFT LCD PANEL   │
Rxin2(+/-) ──→ │ CONNECTOR    │     │ TIMING           │        │ DRIVER│   │ (1024x3x768)    │
VCLK(+/-)  ──→ │ (JAE-FI-     │     │ CONTROLLER       │        │ IC    │   │                 │
Vcc        ──→ │ SEB20P-HF10) │     └──────────────────┘        │       │   │                 │
GND        ──→ │              │                                 │       │   └─────────────────┘
               │              │     ┌──────────────────┐        │       │   ┌─────────────────┐
               │              │     │ DC/DC CONVERTER &│        │       │   │ DATA DRIVER IC  │
               │              │ ──→ │ REFERENCE VOLTAGE│ ───────┘       │   └─────────────────┘
               └──────────────┘     │ GENERATOR        │
                                    └──────────────────┘
VL ──→ ┌─────────────────────┐                                 ┌─────────────────┐
       │ LAMP CONNECTOR      │ ──────────────────────────────→ │ BACKLIGHT UNIT  │
       │ (JST-BHSR-02VS-1)   │                                 └─────────────────┘
       └─────────────────────┘
```

4.2 BACKLIGHT UNIT

1 HV (White)
2 LV (Black)

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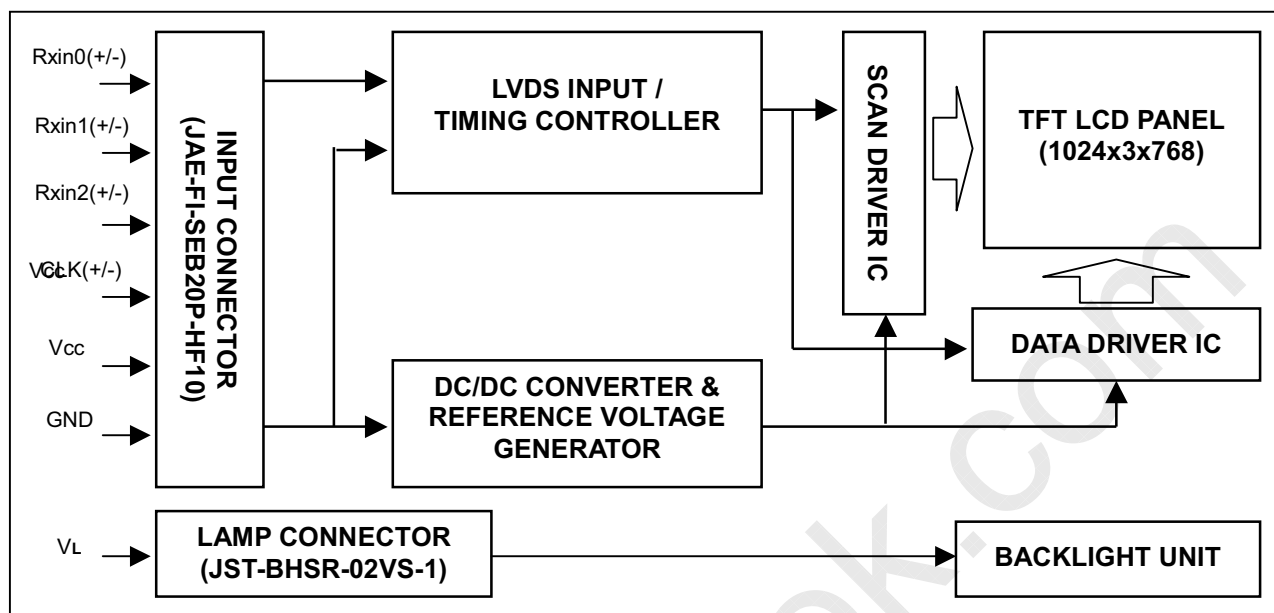
5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Symbol	Description	Polarity	Remark
1	Vcc	Power Supply +3.3 V		-
2	Vcc	Power Supply +3.3 V		-
3	Vss	Ground		-
4	Vss	Ground		-
5	Rxin0-	LVDS Differential Data Input	Negative	R0~R5,G0
6	Rxin0+	LVDS Differential Data Input	Positive	
7	Vss	Ground		-
8	Rxin1-	LVDS Differential Data Input	Negative	G1~G5,B0,B1
9	Rxin1+	LVDS Differential Data Input	Positive	
10	Vss	Ground		-
11	Rxin2-	LVDS Differential Data Input	Negative	B2~B5,DE,Hsync,Vsync
12	Rxin2+	LVDS Differential Data Input	Positive	
13	Vss	Ground		-
14	CLK-	LVDS Clock Data Input	Negative	LVDS Level
15	CLK+	LVDS Clock Data Input	Positive	
16	Vss	Ground		-
17	VEDID	3.3V Power		-
18	NC	Non-Connection		-
19	CLKEDID	DDC Clock		-
20	DATAEDID	DDC Data		-

Note (1) Connector Part No.: JAE-FI-SEB20P-HF10 or equivalent

Note (2) User's connector Part No: JAE-FI-S020S or equivalent
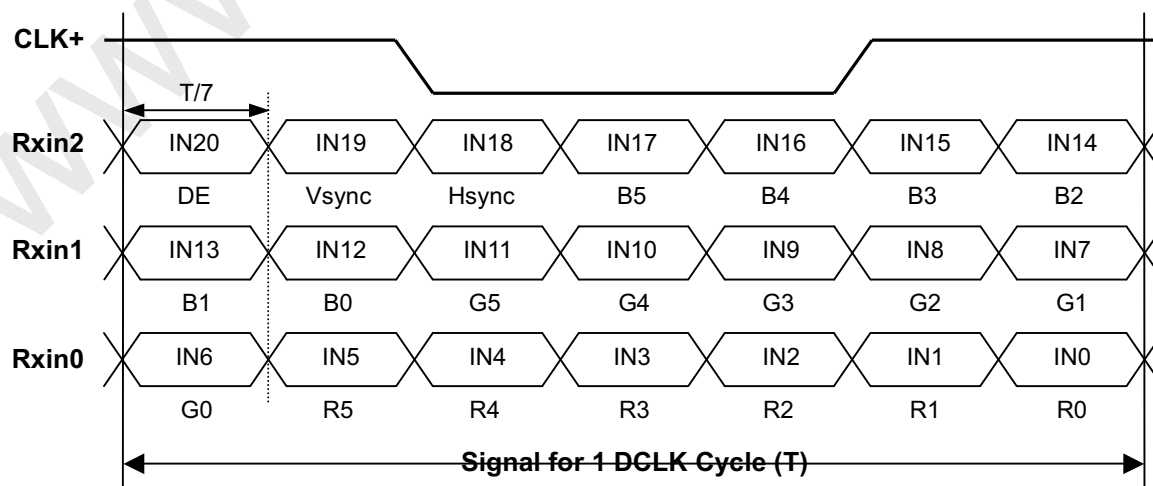
Note (3) The first pixel is even.

5.2 BACKLIGHT UNIT

Pin	Symbol	Description	Color
1	HV	High Voltage	White
2	LV	Ground	Black

Note (1) Connector Part No.: JST-BHTR-02VS-1 or equivalent

Note (2) User's connector Part No.: JST-SM02B-BHTS-B-TB or equivalent

5.3 TIMING DIAGRAM OF LVDS INPUT SIGNAL

CLK+							
	T/7						
Rxin2	IN20	IN19	IN18	IN17	IN16	IN15	IN14
	DE	Vsync	Hsync	B5	B4	B3	B2
Rxin1	IN13	IN12	IN11	IN10	IN9	IN8	IN7
	B1	B0	G5	G4	G3	G2	G1
Rxin0	IN6	IN5	IN4	IN3	IN2	IN1	IN0
	G0	R5	R4	R3	R2	R1	R0

Signal for 1 DCLK Cycle (T)

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5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																		
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

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6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	20	65	68	MHz	-
DE	Frame Time Cycle	TV	771	806	850	TH	-
	Vertical Active Display Period	TVD	768	768	768	TH	-
	One Line Scanning Time Cycle	TH	1200	1344	1600	Tc	-
	Horizontal Active Display Period	THD	1024	1024	1024	Tc	-

Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set

to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM
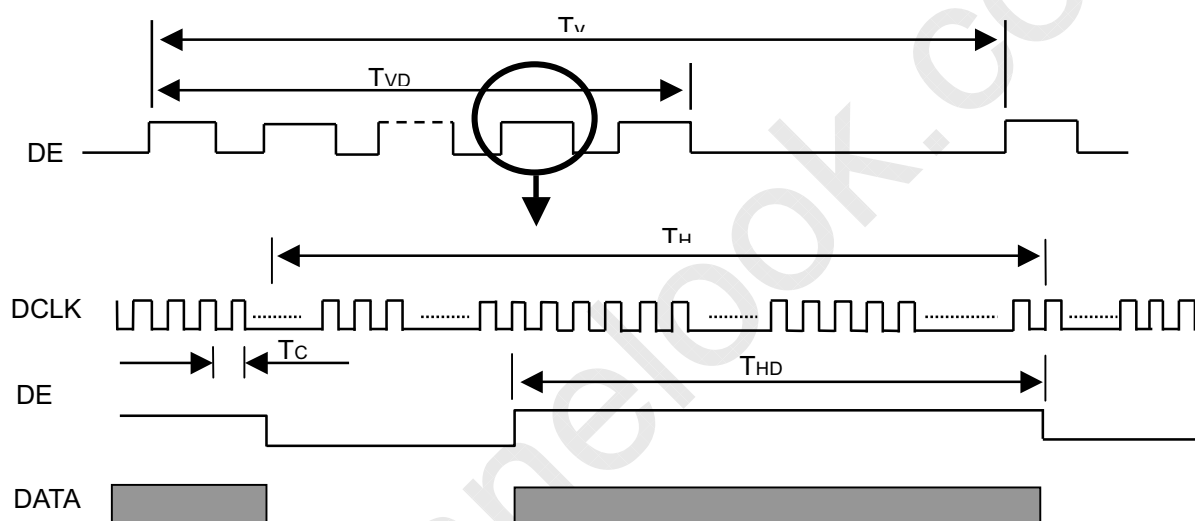
6.2 POWER ON/OFF SEQUENCE

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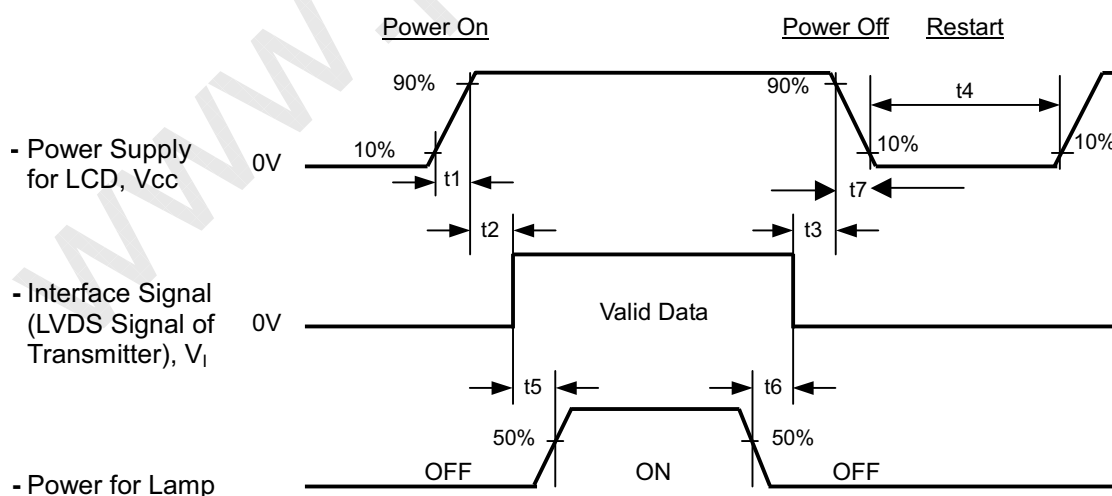
Timing Specifications:

$0 < t1 \leqq 10$ msec $0 \leqq t7 \leqq 50$ msec (given by system)

$0 < t2 \leqq 50$ msec $0 \leqq t7 \leqq 400$ msec (measured on TFT-LCD module)

$0 < t3 \leqq 50$ msec

$t4 \geqq 200$ msec

$t5 \geqq 200$ msec

$t6 \geqq 5$ msec

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

6.3 Momentary Voltage Drops
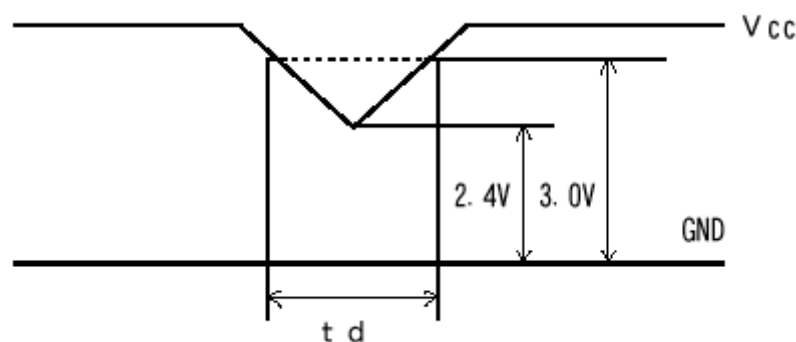
(1)   When $2.4V \leqq Vcc < 3.0V$ and $td \leqq 10ms$, the unit must work normally when VCC return to 3.0V.

(2)   When Vcc < 2.4V, momentary voltage shall conform to the input voltage sequence.

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7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	^{o}C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	6.0	mA
Inverter Driving Frequency	F_L	60	KHz
Inverter	Sumida H05-4915		

The relative measurement methods of optical characteristics are shown in 6.2. The following items should be measured under the test conditions described in 6.1 and stable environment shown in Note (6).

7.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR		150	250	-	-	(2), (6)
Response Time		T_R		-	6.0	10.0	ms	(3)
		T_F		-	17.0	25.0	ms	
Center Luminance of White		L		170	200	-	cd/m^2	(6)
Average Luminance of White		L_{AVE}		150	180	-	cd/m^2	(4), (6)
Cross Talk		CT		-	-	3.0	%	(5), (6)
Color Chromaticity	Red	Rx	$\theta_x=0°$, $\theta_Y=0°$ Viewing Normal Angle	0.597	0.627	0.657	-	(1), (6)
		Ry		0.323	0.353	0.383	-	
	Green	Gx		0.268	0.298	0.328	-	
		Gy		0.556	0.586	0.616	-	
	Blue	Bx		0.115	0.145	0.175	-	
		By		0.066	0.096	0.126	-	
	White	Wx		0.283	0.313	0.343	-	
		Wy		0.299	0.329	0.359	-	
	Color Gamut	C.G%		50	60	-	%	(8)
Viewing Angle	Horizontal	θ_x+	CR≥10	40	45	-	Deg.	(1), (6)
		θ_x-		40	45	-		
	Vertical	θ_Y+		10	15	-		
		θ_Y-		30	35	-		
Surface Reflection Ratio		S_R		-		3.0	%	(9)

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Note (1) Definition of Viewing Angle (θx, θy):

Normal

$\theta x = \theta y = 0°$

$\theta y-$ $\theta y+$

$\theta x- = 90°$ x-

12 o'clock direction

$\theta y+ = 90°$

y+

$\theta x-$

$\theta x+$

6 o'clock

y-

$\theta y- = 90°$

x+ $\theta x+ = 90°$
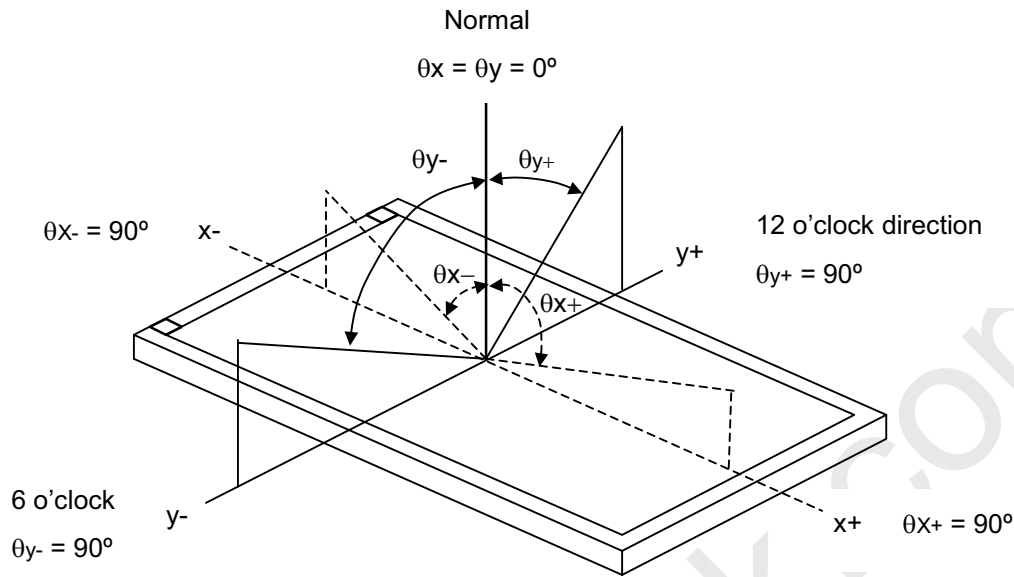
Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.
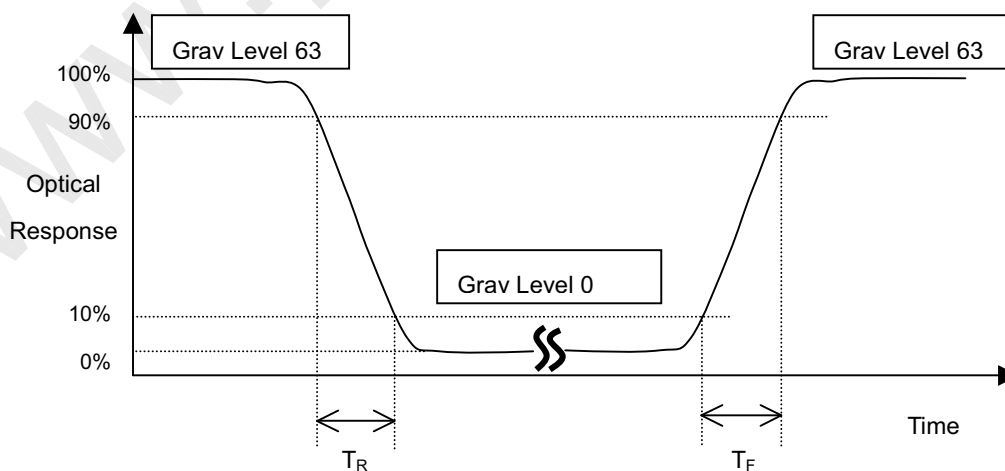
Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (7).

Note (3) Definition of Response Time (T_R, T_F):

Grav Level 63   Grav Level 63

100%

90%

Optical

Response

Grav Level 0

10%

0%

Time

T_R T_F

Version 2.0

Issued Date: Mar. 12, 2003
Model No.: N150X1–L05

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Note (4) Definition of Average Luminance of White (L_{AVE}):

Measure the luminance of gray level 63 at 5 points

L_{AVE} = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

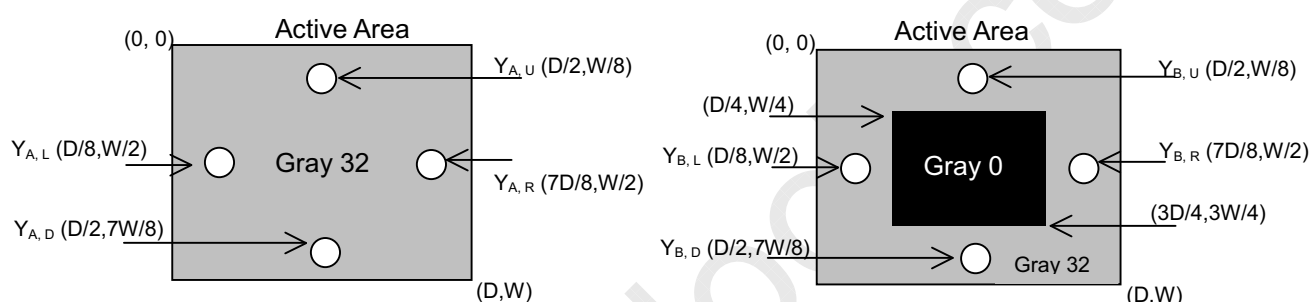L (x) is corresponding to the luminance of the point X at Figure in Note (7).

Note (5) Definition of Cross Talk (CT):

CT = | Y_B – Y_A | / $Y_A \times 100$ (%)

Where:
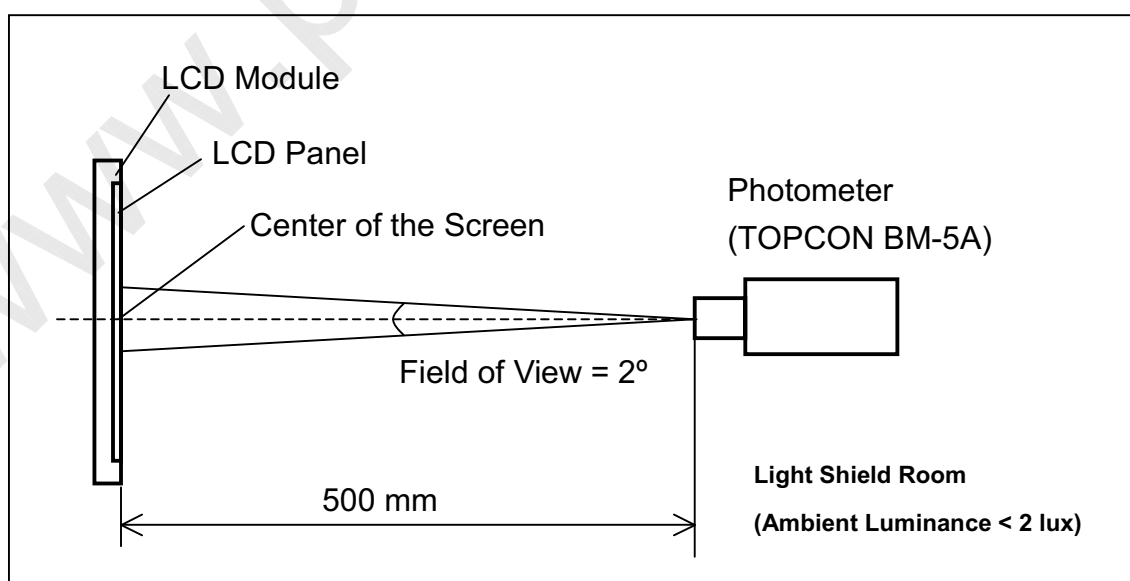
Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m^2)


Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.

LCD Module
LCD Panel
Center of the Screen
Photometer (TOPCON BM-5A)
Field of View = 2º
500 mm
Light Shield Room
(Ambient Luminance < 2 lux)

Version 2.0

Approval

Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

Horizontal Line

Active Area

Version 2.0
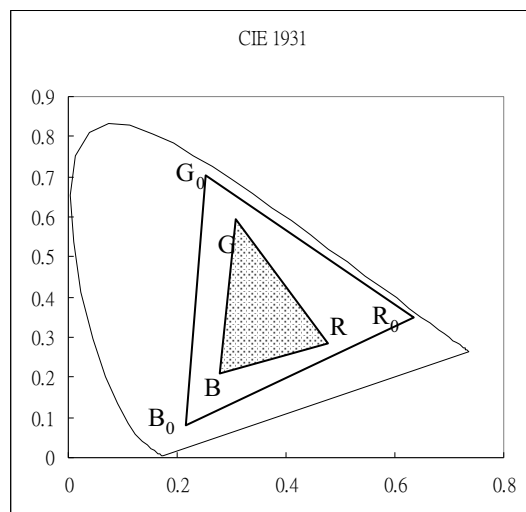
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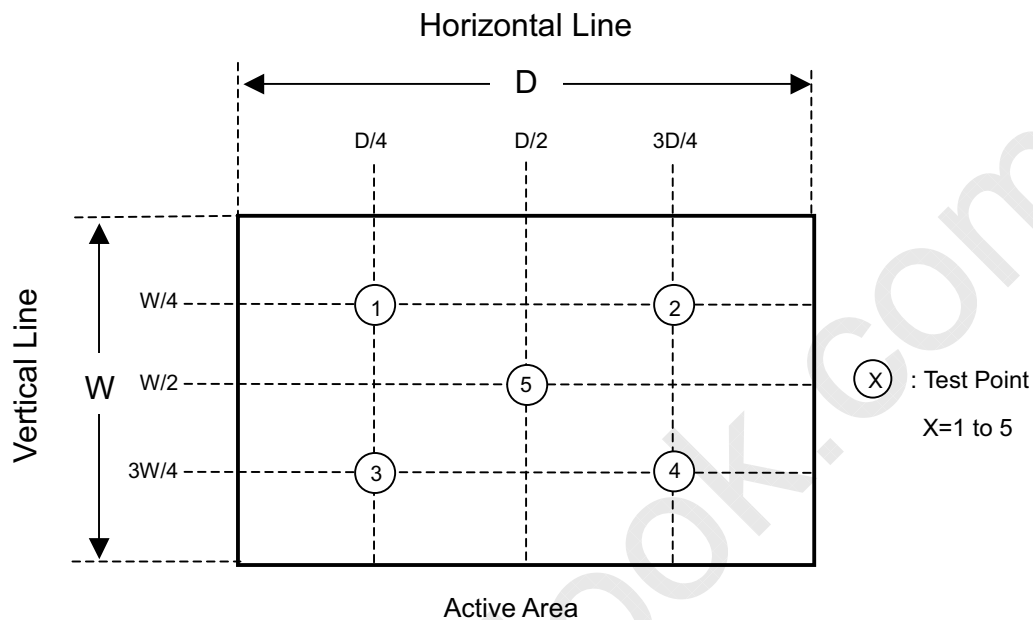
Note (8) Definition of color gamut (C.G%):

C.G%= $\Delta R\,G\,B / \Delta R_0\,G_0\,B_0$,

R_0, G_0, B_0 : color coordinates of red, green, and blue defined by NTSC, respectively.

R, G, B : color coordinates of module on 255 gray levels of red, green, and blue, respectively.

$\Delta R_0\,G_0\,B_0$: area of triangle defined by R_0, G_0, B_0
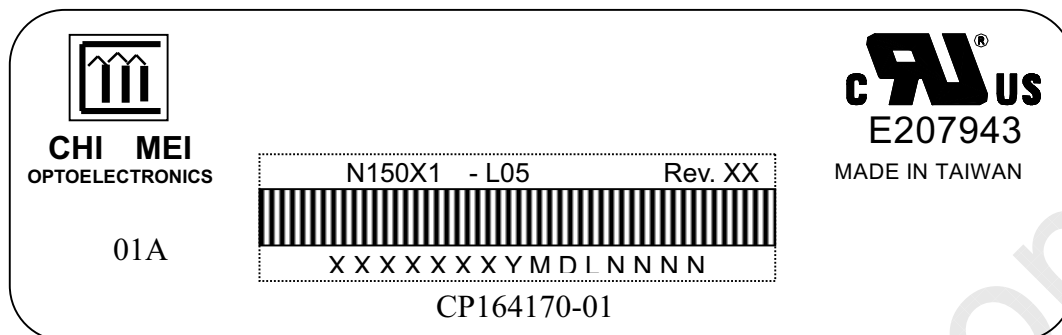
$\Delta R\,G\,B$: area of triangle defined by R, G, B

Note (9) Definition of Surface Reflection Ratio (S_R):

The spec was from the approval sheets of polarizer.

Version 2.0

Issued Date: Mar. 12, 2003
Model No.: N150X1–L05

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CHI MEI OPTOELECTRONICS CORP.

8. DEFINITION OF LABELS

8.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

CHI MEI
OPTOELECTRONICS

01A

N150X1 - L05   Rev. XX

X X X X X X X Y M D L N N N N

CP164170-01

E207943
MADE IN TAIWAN

(a) Model Name: **N150X1** - L05

    Sub-Model Name for Sub-Model version control

    Model Name (For Safety Application, please uses this module name. Sub-Module Name may be changed)

(b) Revision: Rev. XX, for example: A0, A1… or C1, C2…etc.

(c) Serial ID: X X X X X X X Y M D L N N N N

    Serial No.

    Product Line

    Year, Month, Date

    CMO Internal Use

    CMO Internal Use

    Revision

    CMO Internal Use

(d) Fujitsu product code: CP164170-01

(e) Fujitsu revision no.:01A, 02A,……..etc

Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2001~2009

    Month: 1~9, A~C, for Jan. ~ Dec.
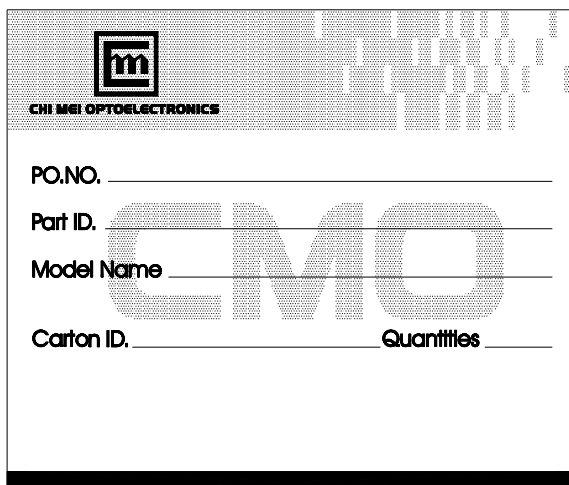
    Day: 1~9, A~Y, for 1st to 31st, exclude I,O and U.

(b) Revision Code: Cover all the change

(c) Serial No.: Manufacturing sequence of product

(d) Product Line: 1 -> Line1, 2 -> Line 2, A -> Line A …etc.

Version 2.0

Issued Date: Mar. 12, 2003
Model No.: N150X1–L05

Approval

8.2 Carton Label

9. Packing

9.1 Carton

Box dimensions: 422(L)x337(W)x345(H)mm
Weight: Approx. 8.5Kg(10modules per 1 box)

24 / 26

Version 2.0

9.2 Pallet

Corner Protector: L1350 50mm*50mm
Pallet: L1050*W890*H135mm
Bottom Cap: L1050*W890*H120mm

Pallet Stock Dim: L1050*W890*H1525mm

PE Sheet

Corner Protector

Film

PP Belt

Bottom Cap

Pallet

Carton Label

Version 2.0

Approval
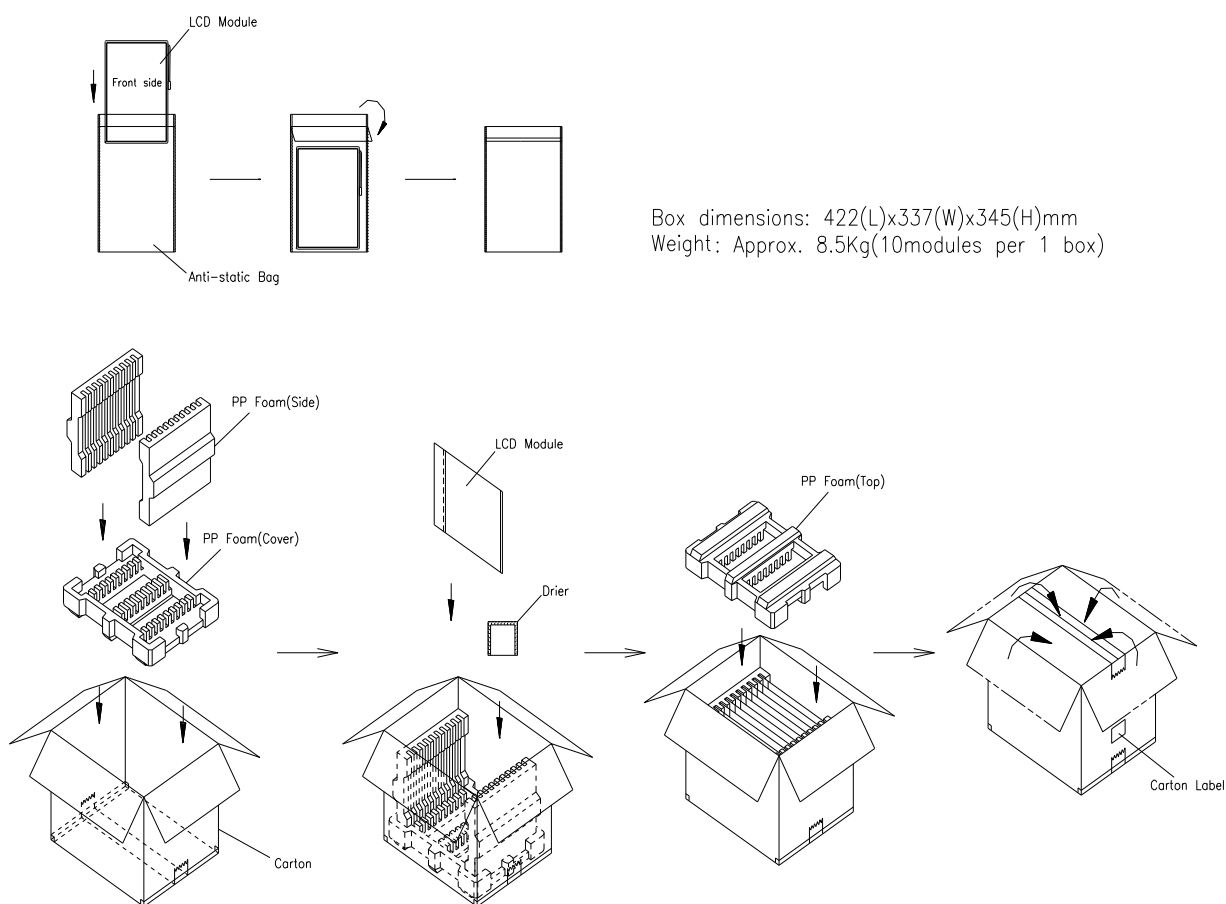
10. RRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

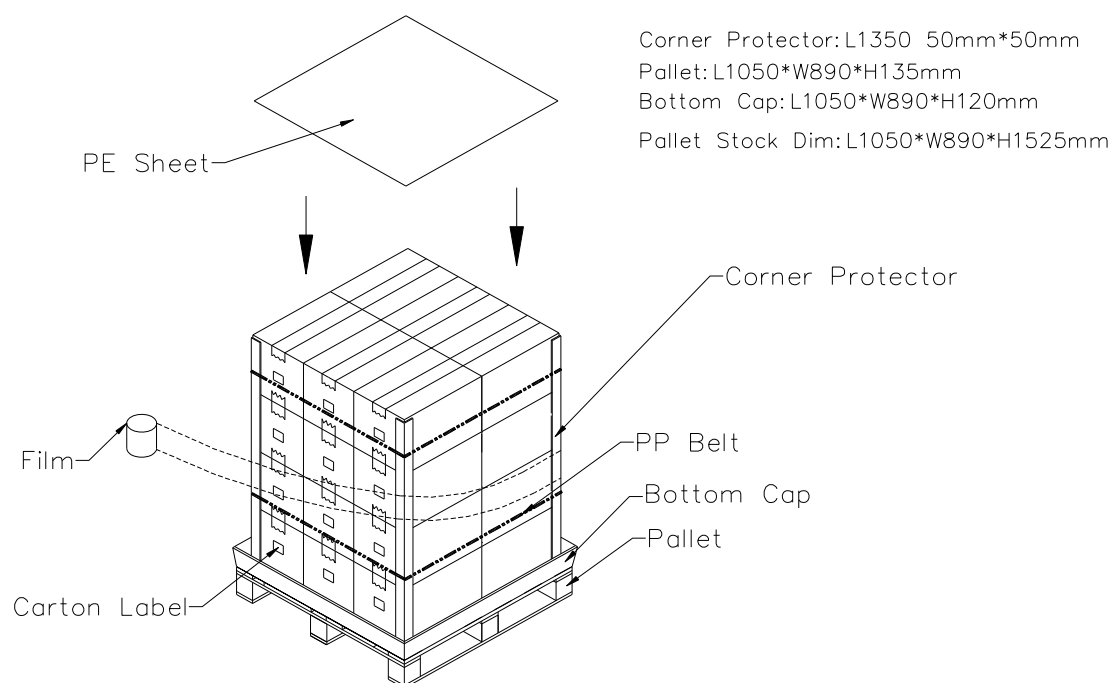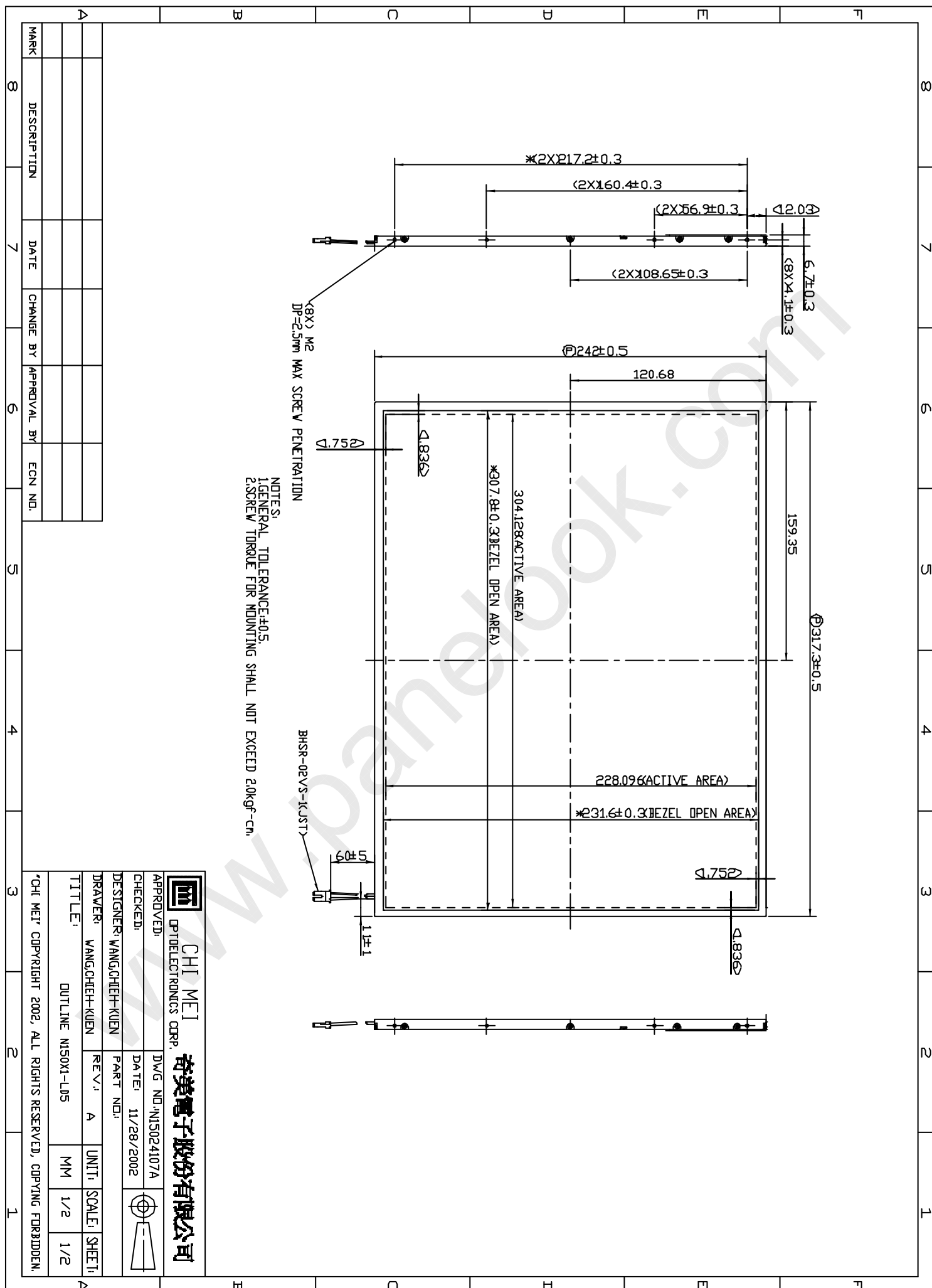(3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.

(4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.

(9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(10) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly, and the starting voltage of CCFL will be higher than room temperature.

10.2 SAFETY PRECAUTIONS

(1) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(3) After the module's end of life, it is not harmful in case of normal operation and storage.

Version 2.0

NOTES:
1.GENERAL TOLERANCE:±0.5.
2.SCREW TORQUE FOR MOUNTING SHALL NOT EXCEED 2.0kgf-cm.

(8X) M2
DP=2.5mm MAX SCREW PENETRATION

BHSR-02VS-1(JST)

*(2X)217.2±0.3
(2X)160.4±0.3
(2X)56.9±0.3
(12.0)
(2X)108.65±0.3
6.7±0.3
(8X)4.1±0.3

(P)242±0.5
120.68
159.35
(P)317.3±0.5
(1.75)
(0.836)
*307.8±0.3(BEZEL OPEN AREA)
304.128(ACTIVE AREA)
228.096(ACTIVE AREA)
*231.6±0.3(BEZEL OPEN AREA)
(1.75)
(0.836)
60±5
1±1

CHI MEI
OPTOELECTRONICS CORP.
奇美電子股份有限公司

APPROVED:
CHECKED:
DESIGNER: WANG,CHIEH+KUEN
DRAWER: WANG,CHIEH+KUEN
TITLE: OUTLINE N150X1-L05

DWG NO:N15024107A
DATE: 11/28/2002
PART NO:
REV.: A
UNIT: MM
SCALE: 1/2
SHEET: 1/2

MARK	DESCRIPTION	DATE	CHANGE BY	APPROVAL BY	ECN NO.

MODEL LABEL

NJ50XI-L05 RevXX
01A
OPTOELECTRONICS
CHI MEI
XXXXXXXXYNNLNNN
CP16417D-01
E207943
MADE IN TAIWAN

JAE FI-SEB20P-HF10

20
1
47.2
134.4

CHI MEI
OPTOELECTRONICS CORP.
奇美電子股份有限公司

APPROVED:	DWG NO:	NJ5024107A
CHECKED:	DATE:	
DESIGNER: WANG,CHIEH+KUEN	PART NO:	
DRAWER: WANG,CHIEH+KUEN	REV:	A
TITLE:		
OUTLINE NJ50X1-L05	UNIT:	MM
	SCALE:	1/2
	SHEET:	2/2

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MARK	DESCRIPTION	DATE	CHANGE BY	APPROVAL BY	ECN NO.